

# FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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## Flight.

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## EDITORIAL COMMENT.

### The Flying Services and the Future.

Were the war to continue in its present intensity for a year or two, and were the present rate of British aeroplane construction even doubled or trebled—and it is no secret that a goodly number of machines are being turned out by our manufacturers—in our opinion the sum total would still be far short of what could be advantageously used by ourselves and our Allies, in helping towards bringing the present slaughter to an end. Machines, however, are but one item in the Air Service as a unit. There are other vital considerations to be taken into account, considerations which for the time put a limit to the actual number of machines which it is possible to usefully employ. The supply of really efficient engines is one of paramount importance. Magnificently as British engineers have risen to the occasion, we are looking forward to the time when there will no longer be the smallest anxiety as to shortage of British-built power plants for installing into the aeroplane bodies, thus rendering them animate objects, ready to answer the guiding hand of our flying men, and bring back more and more information to the executive, enabling them to profit by every new move of our enemies. As to the supply of flying officers, this probably is the most vital of all to obtaining efficient air service. And, in this connection,

the steady flow of pupils at the numerous aviation schools is a cause for confidence in the future, a confidence for which the whole-hearted conscientious spirit embodied in the methods of the instructing schools is to be thanked. They are one and all doing magnificent work in the civilised world's cause by bringing to efficiency day by day more and more pilots, so that they may be drafted into the different services to acquire in practice, under their commanding officers, that skill which has already practically placed our flying forces in a dominant position in the area of hostilities. We believe that we have been more than able to keep pace numerically with the central European powers, in building machines and in training officers to handle them. This advantage is much more likely to be increased, as the weeks go by, than the reverse, a state of things which is highly gratifying to us as a nation, having regard to the leeway which we had to make up at the outbreak of war. But it has ever been thus with Britishers. In times of peace an attitude of *laissez faire* is almost normal where national affairs are concerned, with the majority of our millions. But when real emergency arises, the bulldog spirit is instantly roused, and woe to those who have allowed our outward appearance of lethargy to enter into their calculations for attaining their ends. The much talked of "decadent race" quickly gets the lie, and the alertness of every thinking subject of His Majesty the King is ready upon the hint of "Who said rats?" to throw aside his apparent indifference and fill any breach that may be necessary to maintain those rights of civilisation for which so many generations have in the past shed their blood.

Coming to figures, the record of the first four months of 1915 of pilots qualifying for their Royal Aero Club certificates is more than three times that of the corresponding period of 1914. Yet the cry is, still they come—and the more the merrier. Never were the flying schools so full up with pupils anxious to do their bit for the nation. It is almost a case of selection, by taking the more promising men and getting them forward quickly. And with the better weather in front of us the congestion is more likely to be greater than less, which is as it should be. One comfort, however, is that there is room and to spare for all. It is not a case of for the war only, although that is a good enough inducement for many of those seeking to join up with the R.N.A.S. or R.F.C. It is the beginning of the establishment of one of the greatest revolutions which the world has seen. Much as

this criminal war is to be deplored, it will at least leave one great mark upon the world's history, outside the ghastly horrors and ruination which its prosecution has entailed. To its sudden advent must be credited the foundation upon a solid basis of aviation as an industry. By aviation's outstanding importance to all the nations concerned it has forced itself into the minds of the entire world as an accomplished fact—a state of things which would otherwise have taken a decade or more to establish in a like degree. There will be no turning back after a blessed, and we hope universal, peace is established. Rather the reverse. It will take its place in the regular industries of the world, and we may safely prophesy that the twentieth century will assuredly prove to be the Flying Age. Not only will it be incumbent upon the leading nations of the world to maintain an ever-growing fleet of aeroplanes—in the years far ahead, we are optimistic enough to think that this may easily run to tens of thousands for Great Britain alone—for which by degrees pilots will have to be found and renewals consistently kept up, but there will be the at present untouched sporting side of aviation to cater for, a development which will, we believe, be far beyond

anything the most sanguine would at present care to set out.

But it will come, and before the next generation has time to grow too old to recall the croak of the unbelievers in the conquest of the air. In America this side of the movement is already beginning to materialise, and with the unbounded advantages which exist in the United States, with its vast waterways and open country, for its rapid development, we have little doubt that, as in motor boating, our American cousins will lead the way in establishing this industry which will eventuate in all sorts of surprises, in its ultimate application. To live away down at some river or seaside resort will be as nothing then. A speedy flight to New York, by way of example, having in mind the formal establishment of landing facilities on the river already announced by the Automobile Club of America; from the landing stage to the office by motor car, and the whole journey accomplished in a fraction of the time at present necessary. This is no dream. It is already being put into execution, and it is only a matter of time for it to spread and for pleasure aeroplanes to become like mechanical vehicles, a matter for no comment.



## THE LATE 2ND LT. W. B. R. RHODES-MOORHOUSE, R.F.C.

IT was with the most sincere regret that the announcement was received last week of the death of 2nd Lieut. Rhodes-Moorhouse, through the following notice in the *Times* :—

**RHODES-MOORHOUSE.**—On Tuesday, April 27th, of wounds received while dropping bombs on Courtrai the day before, William Barnard Rhodes-Moorhouse, Second Lieutenant Royal Flying Corps, aged twenty-seven, dear elder son of Mr. and Mrs. Edward Moorhouse, of Parnham House, Dorset, and most loved husband of Linda Rhodes-Moorhouse.

To all those who had followed this fearless officer's career the news came as a shock, made more acute by the loss to the nation which his death entailed at the present period of operations. At least his end has been one the memory of which will be treasured as a family honour in the years to come, although the blow of his passing away is not lessened for those near and dear to him, especially his widow. That his obituary notice

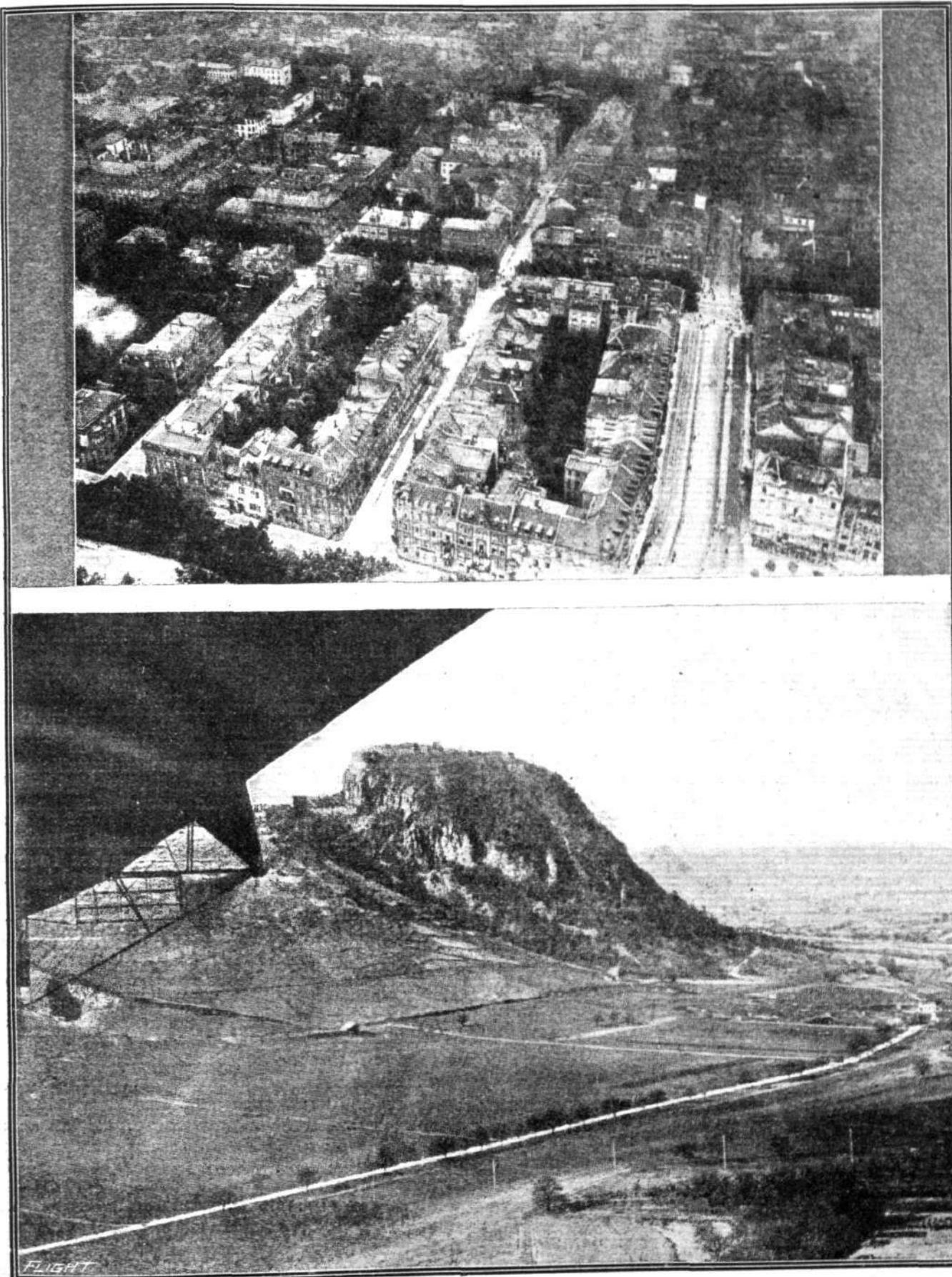
should have been written by "Eye-Witness" in such glorious terms\* ensures that his good work for his country will live for future generations, in spite of the official document treating only of a nameless hero. That that hero is identical with the late flying officer is no longer a secret, and no finer epitaph was ever penned than the tribute to his manner of carrying out the mission against the enemy which was entrusted to him. His body was brought back to Dorset for interment in the grounds of his father's residence, Parnham House, Netherbury. May his sorrowing relatives take comfort in the knowledge that his name will survive for all time, and that, in the words of Nelson's historic signal, in spite of the fatal wounds which had overcome him,

"He made his report."

\* The text appears in the official extract on page 314.



FROM ABOVE.—Brighton Palace Pier, a snapshot secured by Mr. Clarence Winchester from a biplane.



MORE VIEWS IN GERMANY, AS SEEN FROM AIRCRAFT.—Above, a view of Mannheim, and below, the Hohentwiel, as seen from the Zeppelin "Deutschland."

## AIRCRAFT WORK AT THE FRONT.

## OFFICIAL INFORMATION.

IN the despatch dated April 30th, from Sir John French it was stated:—

“Yesterday a German aeroplane was attacked in the air and fired at by our guns, and was brought down in our lines east of Ypres.”

In the despatch dated May 3rd from Sir John French there was the following:—

“A German aeroplane yesterday afternoon was chased by one of our machines to within rifle range of our trenches, and was then brought down by fire.”

The following note was issued by the Official Press Bureau on the evening of April 30th:—

“The shelling of Dunkirk is now reported by aerial reconnaissance to have been from a land gun, and reports that German warships were off that port are due to a misapprehension.”

At 1 a.m. on the following day the Admiralty made the following announcement through the Press Bureau:—

“Position of German guns bombarding Dunkirk having been verified by aircraft reconnaissance, it was attacked this evening, twelve small and two large bombs being dropped. A reconnaissance was also made to Ostend, which was clear of all important craft. A Taube appeared in sight, but kept 10,000 ft. up and three miles off. Naval aeroplanes at once rose in chase, on which it retired immediately.”

The following official statement was issued in Cairo on Saturday:—

“On the night of April 28th-29th a small mixed force was sent out from Ismailia to endeavour to surprise the enemy's camp. The enemy, however, had moved during the night towards Fordan, but finding all our posts on the alert, they retired to Bir Mahadat. They were located again at dawn by our aeroplanes, and about midday our cavalry succeeded in coming up with their rearguard, harassing their retreat, and taking a few prisoners.”

In the despatch, dated April 30th, from an “Eyewitness” present with the British General Headquarters there was the following:—

“On Saturday morning (24th), just about dawn, an airship appeared in the sky to the east of our line at this point and dropped four red stars, which floated downwards slowly for some distance before they died out. When our men, whose eyes had not unnaturally been fixed on this display of pyrotechnics, again turned to their front, it was to find the German trenches rendered invisible by a wall of greenish-yellow vapour similar to that observed on the Thursday afternoon, which was bearing down on them on the breeze. . . . On the 28th a hostile aeroplane was forced to descend by our anti-aircraft guns. On coming down in rear of the German lines, it was at once fired upon and destroyed by our field artillery. Another hostile machine was brought down by rifle fire near Zonnebeke.”

“Splendid work has been done during the past few days by our airmen, who have kept all the area behind the hostile lines under close observation. On the 26th they bombed the stations of Staden, Thielt, Courtrai, Roubaix, and other places, and located an armoured train near Langemarck, which was subsequently shelled and forced to retire. There have been several successful conflicts in the air, on one occasion a pilot in a single-seater chasing a German machine to Roulers and forcing it to land.”

“The raid on Courtrai, unfortunately, cost the nation a very gallant life, but it will live as one of the most heroic

episodes of the war.\* The aviator started on the enterprise alone in a biplane. On arrival at Courtrai, he glided down to a height of 300 ft. and dropped a large bomb on the railway junction. While he did this he was the target of hundreds of rifles, of machine guns, and of anti-aircraft armament, and was severely wounded in the thigh.

“Though he might have saved his life by at once coming down in the enemy's lines, he decided to save his machine at all costs, and made for the British lines. Descending to a height of only 100 ft., in order to increase his speed, he continued to fly, and was again wounded, this time mortally. He still flew on, however, and without coming down at the nearest of our aerodromes, went all the way back to his own base, where he executed a perfect landing and made his report. He died in hospital not long afterwards.”

The following statement was issued by the French Embassy on the 29th ult.:—

“German aviators have bombarded with incendiary bombs the open town of Epernay, which is exclusively occupied by ambulance and hospital establishments.”

“There is positive information that the Zeppelin which eight days ago dropped bombs on Dunkirk was seriously injured by the French artillery and completely put out of action. It is stranded in the wood between Bruges and Ghent.”

In the evening *communiqué* issued in Paris on the 30th ult., there was the following:—

“One of our dirigibles bombarded the railway lines and the sheds in the region of Valenciennes. One of our aeroplanes, which was destroyed by an explosion, came down in the enemy's lines.”

In the Saturday evening French *communiqué* it was stated:—

“One of our aeroplanes which flew over Sommepy this morning was struck by a fragment of a shell, which made a hole in the petrol tank. The aeroplane succeeded, however, in getting back to our lines after passing over the first German line at a height of only 400 metres. The machine was riddled with bullets during this difficult passage, and when it landed it was subjected to the fire of the German artillery. The aviators escaped unhurt.”

The following was included in the *communiqué* issued on Sunday evening:—

“We continued during the day to bombard the front south of the entrenched camp of Metz. The effectiveness of our fire was observed on one of the forts as well as on the barracks and the adjacent railway.”

In a statement regarding the long range bombardment of Dunkirk issued by the French Embassy on Sunday, there was the following:—

“Nine shells only having been fired in the second and third bombardments, there is reason to believe either that the gun has been damaged by the nature of its fire, which the more powerful guns cannot stand for long, or that the continued flight of the French aviators in that region has put a stop to the firing.”

In a *communiqué* dated April 28th issued by the Belgian Legation it was reported:—

“The Belgian artillery has vigorously co-operated with

\* See also note on the late 2nd Lt. W. B. R. Rhodes-Moorhouse on p. 312.

the French in their attacks against Steenstraate. Our aviators have shown great activity."

The following *communiqué* was issued in Nish on the 1st inst. :—

"On the morning of the 28th ult., our aviators were engaged in a quick-firing contest with hostile aviators. At six o'clock in the morning a hostile aeroplane was seen coming from the height of Bejania and going in the

direction of Palanka. One of our aviators went off in pursuit, and reached the hostile aeroplane above Smederevo, and opened fire at about 100 metres distance. The hostile aeroplane declined the fight, and crossed the Danube, after firing two shots without effect. Two hours later another hostile aeroplane was seen coming from Palanka. Our machines rapidly chased it back into Austria. This first engagement in the air clearly shows the superiority of our aviators over those of the enemy."

## THE BRITISH AIR SERVICES.

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.

### Royal Naval Air Service.

THE following announcement was made by the Admiralty on the 28th ult. :—

Flight Sub-Lieuts. (Acting Flight-Lieuts.) C. W. H. Pulford and D. Harries promoted to the rank of Flight-Lieutenant, with seniority of March 26th and April 1st, respectively.

Chief Petty Officer (Mechanic) D. W. A. Barton promoted to the rank of Probationary Flight Sub-Lieutenant, with seniority of Jan. 15th, and appointed to "President," additional, for R.N.A.S.

Assistant Paymaster (R.N.R.) P. S. Sykes to "President," additional, for duty with the Armoured Car Division. April 27th.

W. St. G. Clowes granted temporary commission as Lieutenant (R.N.V.R.), with seniority of April 17th; J. O. Davis and E. C. W. Middleton entered as Probationary Flight Sub-Lieutenants, with seniority of April 17th, and all appointed to "President," additional, for R.N.A.S.

Temporary commissions in the R.N.V.R. have been granted as follows: K. M. Sturton and J. B. Vernon, as Lieutenants, with seniority of April 12th; A. E. Eldridge, as Sub-Lieutenant, with seniority of April 12th, and all appointed to "President," additional, for duty with R.N.A.S. To date April 26th.

The following was announced by the Admiralty on the 29th ult. :— Flight-Commander W. Briggs advanced to Acting Squadron-Commander, with seniority of April 24th.

Flight-Lieutenant A. Nickerson advanced to Acting Flight-Commander, with seniority of April 24th.

Temporary Lieut. (R.N.V.R.) P. Barry promoted to Temporary Lieutenant-Commander, with seniority of April 24th.

The following announcement was made by the Admiralty on the 30th ult. :—

Temporary commissions have been granted as follows: The Hon. M. Egerton, as Lieutenant-Commander (R.N.V.R.), with seniority of April 21st; G. C. Torrens, as Lieutenant (R.N.V.R.), with seniority of April 17th; S. F. Burgoine, H. K. Hitchcock, and L. A. Price, as Lieutenants (R.N.V.R.), with seniority of April 29th.

The following have been entered as Probationary Flight Sub-Lieutenants: R. F. S. Leslie, L. H. Wilkins, R. Young, C. B. C. Williams, H. J. English, F. H. M. Maynard, C. H. W. Godfrey, T. I. T. Sloan, J. A. Goodwin, G. G. Hodge, N. Gregory, C. F. Latimer, and S. B. Joyce, all with seniority of May 2nd.

The undermentioned have been entered as Probationary Flight Sub-Lieutenants for temporary service: P. A. Watson, with seniority of April 29th; C. R. Blagrove, G. R. H. Talbot, S. R. Watkins, B. C. Bell, E. P. Hardman, J. MacLarty, and R. Y. Bush, all with seniority of May 2nd.

The following appeared in the *London Gazette* of the 30th ult. :— Temporary Flight Lieut. Herbert Stanley-Adams has been trans-

ferred to the permanent list of Officers in the R.N.A.S. Oct. 31st, 1914.

Flight Sub-Lieut. promoted to the rank of Flight Lieutenant: Stephen Medlicott. April 15th, 1915. (Since dead.)

The following Admiralty announcement was made on the 4th inst. :—

R. L. Alderson granted temporary commission as Lieutenant (R.N.V.R.), with seniority of April 25th, and appointed to "President," additional, for duty with R.N.A.S.

W. G. J. Wardle, entered as Warrant Officer (2nd grade), for temporary service, with seniority of April 23rd.

The following was announced by the Admiralty on the 5th inst. :—

The Hon. A. Verney-Cave has been granted a temporary commission as Lieutenant (R.N.V.R.), with seniority of April 4th, and appointed to "President," additional, for duty with R.N.A.S.

### Royal Flying Corps (Military Wing).

THE following appeared in a supplement to the *London Gazette* issued on the 28th ult. :—

*Adjutant-General's and Quartermaster-General's Staff*.—Deputy-Adjutant-Quartermaster-General.—Capt. (temporary Major) William D. Beatty, R.E. (Squadron-Commander, Military Wing, Royal Flying Corps), and to retain his temporary rank, vice Major J. T. Dreyer, R.A. April 1st, 1915.

*Supplementary to Regular Corps*.—Second Lieutenants (on probation) confirmed in their rank: W. A. Grattan Bellew, R. H. Mayo, and S. H. B. Harris. To be Second Lieutenants (on probation): Alan F. P. H. Somerset-Leeke; April 5th, 1915. Henry E. van Goethem; April 12th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 1st inst. :—

*Assistant Equipment Officer*.—Second Lieut. Sydney H. B. Harris, Special Reserve. April 9th, 1915.

*Supplementary to Regular Corps*.—Lionel M. Bennett to be Second Lieutenant (on probation). April 14th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 3rd inst. :—

The appointment of Second Lieut. F. W. Goodden, Special Reserve, as a Flying Officer, is antedated to Feb. 13th, 1915.

The following appeared in the *London Gazette* of the 4th inst. :—

*Assistant Equipment Officers*.—April 9th, 1915: Second Lieut. Thomas E. Robertson, Special Reserve; Second Lieut. John W. Griffith, Special Reserve; Second Lieut. Charles P. Ogden, Special Reserve.

*Supplementary to Regular Corps*.—Second Lieutenants (on probation) confirmed in their rank: Jack O. Cooper, Rupert H. S. Mealing. To be Second Lieutenants (on probation): Kelham K. Horn; April 15th, 1915. Charles C. Godwin; April 23rd, 1915. Cecil Barber; May 3rd, 1915.

### Central Flying School.

The following appeared in a supplement to the *London Gazette* issued on the 5th inst. :—

Lieut. (temporary Captain) Reginald P. Mills, Royal Fusiliers, (City of London Regiment), a Flight Commander, Military Wing, to be an Instructor, vice Lieut. (temporary Captain) Lord G. Wellesley, Grenadier Guards. April 22nd, 1915.

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### Wounded.

Lieutenant L. G. Hawker, R.F.C. and R.E.

Under date April 29th:

### Wounded.

Second Lieutenant L. Parker, R.F.C.

Lieutenant C. A. Gladston, Intelligence Department attached to the Royal Flying Corps, has been reported by the War Office as missing since April 30th.

According to an obituary notice in the *Morning Post*, R. Upton, R.F.C., died of pneumonia in Tidworth Military Hospital on May 3rd.

### The Roll of Honour.

THE following casualties in the Royal Flying Corps attached to the Expeditionary Force have been officially notified by the War Office:—

Under date April 26th:

### Killed.

Second Lieutenant F. W. Polehampton, R.F.C.

Under date April 27th:

### Died of Wounds.

Second Lieutenant W. B. R. Rhodes-Moorhouse, R.F.C.

## THREE NEW AMERICAN MACHINES.

FOR some time past there has been noticeable a certain activity among American aeroplane manufacturers, consequent no doubt upon the increased interest being taken by the U.S. Government in military aviation, which it is

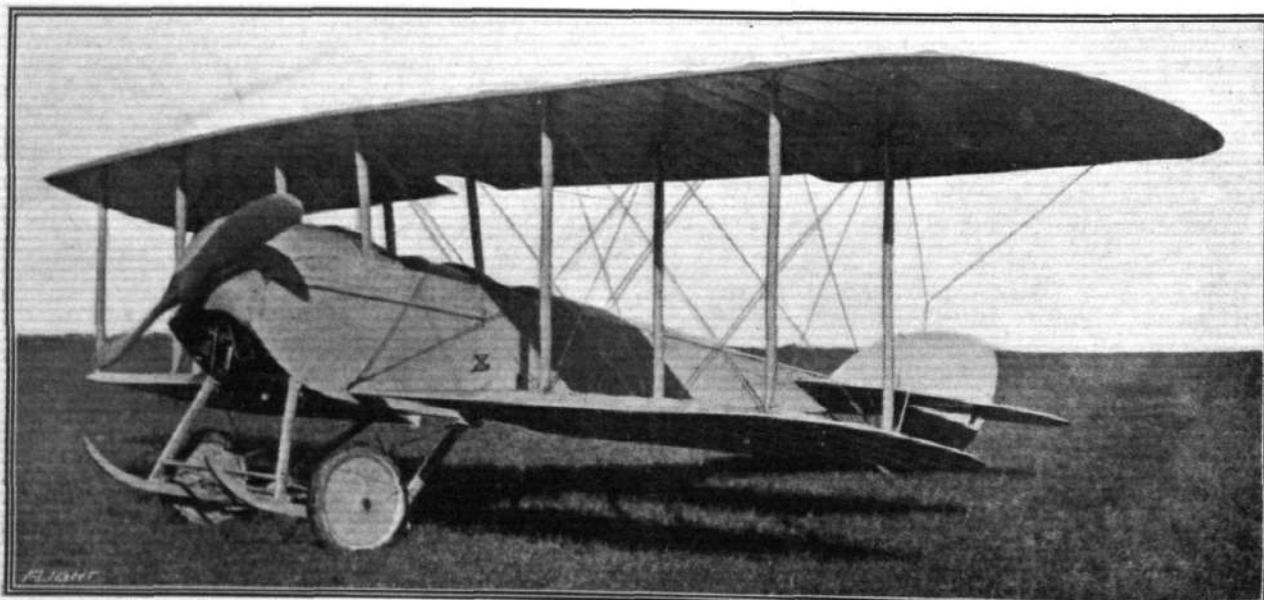
Although retaining a sufficient number of Curtiss characteristics to make her instantly recognisable as coming from the hand of this designer, the new Curtiss military tractor shows pronounced departures from its



One of the latest Curtiss military tractor biplanes with a 160 h.p. Curtiss engine.

hoped will lead to the handing out of substantial orders very shortly. It is also not unlikely that some of the firms hope to do considerable business with European Governments, and it is interesting to notice how the general design of some of the latest machines approximates

prototypes. In the latest machine, which has a Curtiss engine of 160 h.p., the main planes are set at a considerable forward stagger, whilst being straight as seen from in front, that is to say, having no dihedral angle. *Ailerons* are as usual hinged to the outer rear inter-plane



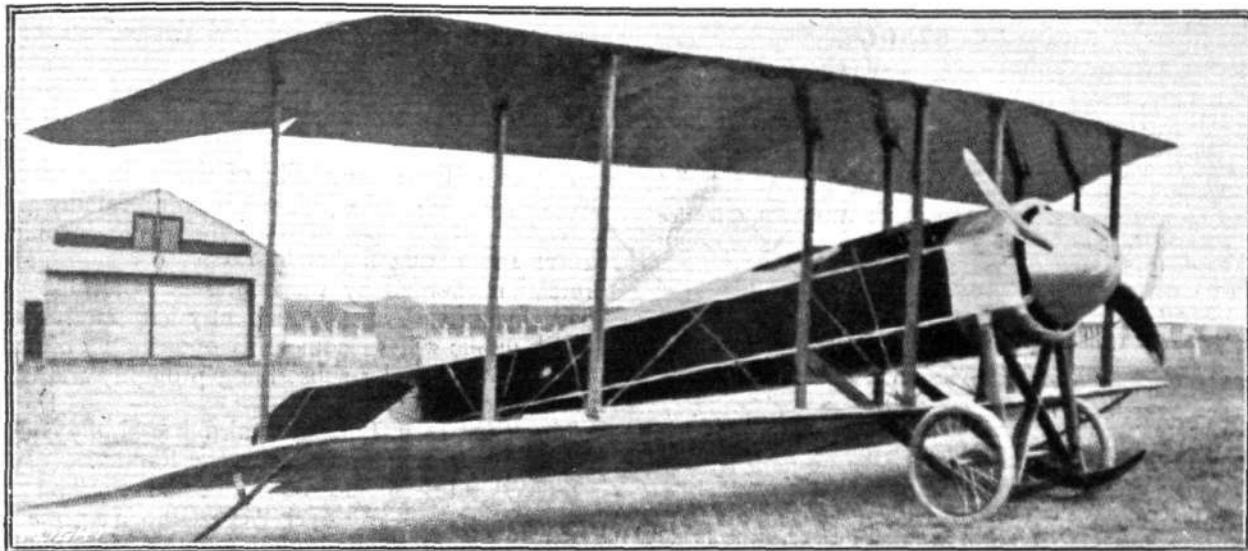
The armoured Heinrich military tractor equipped with a 110 h.p. Gyro motor.

very closely to those which have proved most successful over here. This is clearly shown in the photographs which we reproduce of some military tractors that have recently made their first appearance, and passed their preliminary trials.

struts instead of to the trailing edge of the upper plane, as is the general practice on this side of the "pond." Pilot and passenger are accommodated tandem fashion in the same cock-pit, and appear to be placed unusually far back, even allowing for the extra weight of the 160 h.p.

engine. The chassis is, on the other hand, placed very far forward, supporting, in fact, the engine only, leaving the combined weight of pilot, passenger, controls and instruments unsupported, an arrangement which would seem to impose

the pilot, Mr. Harold Kantner, is said to have felt so confident in the stability of his mount that he let go of the controls and made a prolonged flight with his hands raised above his head.



The new Gallaudet military tractor biplane.

severe bending stresses in the body in a heavy landing. In the Gallaudet military tractor biplane the influence of German designing practice can be clearly traced in the backswept main planes and upturned ailerons. The arrangement of the fuselage is somewhat reminiscent of the Handley Page biplane in the manner of carrying the lower plane right across instead of attaching the two halves of it, as it is done in most machines, to the sides of the body. Also in the covering of the body is German influence noticeable, as this takes the form of three-ply instead of the usual fabric covering. The chassis is of the Vee-type, having the rear members continued forward in the form of tusks or short skids. The engine is a 50 h.p. Gnome, which it is intended later, we understand, to replace with a Gyro.

A hemispherical nose-piece encloses the centre part of the propeller so as to form a good entry for the air. During the first flight of this machine

Like the Gallaudet machine, the Heinrich military tractor may be said to belong to the "Arrow" type, having slightly back-swept main planes, of which the upper has a pronounced overhang.

These extensions are braced in a downward direction by cables running to the lower ends of the outer pair of interplane struts, but no provision has been made, it appears, for bracing them upwards either by means of king posts or some similar arrangement.

The body is of rectangular section, and is armoured in front so as to protect, as far as possible, the engine, observer, and pilot.

With the new 110 h.p. Gyro motor, which is, by the way, the first motor of that type to be delivered, a speed of 46 to 50 m.p.h. is anticipated, a very

good speed range for an armoured machine. For a span of 35 ft. and a length of 24 ft. 6 ins., the machine has a weight of 950 lbs.



The Gallaudet in flight.

#### The Aerial Raid on Suffolk.

As barren of results, from a military point of view, as its predecessors was the aircraft raid on certain parts of Suffolk in the early hours of Friday of last week. No lives were lost, but both in Ipswich and Bury St. Edmunds some house property was burned. About 12.20 a.m. incendiary bombs were dropped at Ipswich, in Waterloo Road and Brookhall Road, with the result that three houses were burnt out, some of the sleeping occupants having remarkable escapes. Some more bombs were dropped at Whitton, and then the airship went on to Bury St. Edmunds, where a large number of incendiary bombs were dropped in the neighbourhood of the Butter Market and other parts of the city, five or six shops

being more or less badly damaged by fire. It will be seen that, according to the German report, "Coast fortifications at Harwich were bombarded."

In the evening of the same day there were a number of reports as to airships having been seen off the coast. At Wells four were said to have been seen over the sea. Some of the reports probably related to British aircraft on scouting duty.

#### Hostile Aircraft Over Dover.

ACCORDING to reports from Dover, a hostile aeroplane was sighted on Sunday morning flying in a westerly direction. The anti-aircraft guns opened fire, and the machine disappeared in the direction of Folkestone. It was at a great height, and no bombs were dropped.



# The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

## Aviators' Certificates.

THE following Aviators' Certificates have been granted:—

1195 2nd Lieut. Henry Richard Deighton Simpson (6th Inniskilling Dragoons), (Maurice Farman Biplane, Military School, Shoreham). March 31st, 1915.

1196 Lieut. George Osborn Hayne (Maurice Farman Biplane, Military School, Shoreham). April 11th, 1915.

1197 2nd Lieut. Francis Leopold Mond, R.F.A. (T.F.), (Maurice Farman Biplane, Military School, Farnborough). April 22nd, 1915.

1198 Lieut. Alister Somervail (King's Own Scottish Borderers) (Maurice Farman Biplane, Military School, Farnborough). April 24th, 1915.

1199 2nd Lieut. Charles Kennedy Cochran-Patrick (Maurice Farman Biplane, Military School, Farnborough). April 27th, 1915.

1200 Flight Sub-Lieut. Arthur Frederick Foy Jacob, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). April 29th, 1915.

1201 Donald Alastair Leslie Davidson (Maurice Farman Biplane, Military School, Brooklands). April 30th, 1915.

1202 Joseph Alan Howard Crook (L. and P. Biplane, London and Provincial School, Hendon). April 30th, 1915.

1203 Lieut. James Bird, R.N.V.R. (Maurice Farman Biplane, Royal Naval Air Station, Hendon). April 30th, 1915.

1204 Harry Frederick Stevens (Hall Biplane, Hall School, Hendon). April 30th, 1915.

## THE FLYING SERVICES FUND.

Administered by The Royal Aero Club.

THE Lords Commissioners of the Admiralty and the Army Council having signified their approval, the Royal Aero Club has instituted and will administer a fund originated by M. André Michelin for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active

service, and for the widows and dependents of those who are killed.

The fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers and men.

In view of the great utility of the work of the Flying Services, evidence of which has been repeatedly given in the official despatches of the Commander-in-Chief, the skilful and daring flights into enemy country, and the protection afforded by the continuous patrolling of our coast by aircraft, it is confidently expected that the British public will welcome this opportunity of showing their appreciation by subscribing promptly and liberally to the fund.

The Right Hon. Lord Kinnaird has kindly consented to act as Honorary Treasurer to the Fund.

Subscriptions should be forwarded to The Flying Services Fund, The Royal Aero Club, 166, Piccadilly, London, W., or to Barclay and Co., Ltd., 1, Pall Mall East, London, S.W. Cheques should be crossed "Barclay and Co., Ltd."

TULLIBARDINE, Brig.-General,  
Chairman of the Royal Aero Club.

	£ s. d.		£ s. d.
Total subscriptions received to April 28th, 1915...	8,599 12 7	A Cornish Girl ...	0 2 0
Employés of the Blackburn Aeroplane and Motor Co., Ltd. ...	1 0 0	Miss Margaret Young ...	1 0 0
Miss Dowd ...	0 4 0	Admiral the Hon. Sir E. K. Fremantle, G.C.B., C.M.G. ...	1 1 0
John Marston, Ltd. ...	5 0 0	Collected by Mrs. Anderson ...	113 0 6
Lieut. Sir A. H. M. Sinclair, Bart. ...	50 0 0	Total, May 5th, 1915 ...	8,771 0 1
166, Piccadilly, W.		B. STEVENSON, Assistant Secretary.	

## FROM THE BRITISH FLYING GROUNDS.

## London Aerodrome, Colindale Avenue, Hendon.

**Grahame-White School.**—Thursday, last week, Probationary Flight Sub-Lieut. Jacobs *brevet* tests, which he passed, gaining certificate.

Friday, Probationary Flight Sub-Lieuts. Bingham, Burling, Coleman, De Ville, Simpson and Wain straights, with Instructors Manton, Winter and Russell. Probationary Flight Sub-Lieuts. Bone and Kerby solo circuits, eights, landings, practice, &c.

Too windy the earlier part of the week for school work.

**Beatty School.**—The following pupils received instruction during last week:—Messrs. Allcock, Bond, Bright, Chapelle, Cooper, Crowe, de Meza, Fanning, Fraser, Leong, Monfea, Roche, Whincup, Wiles, Crossman, Johnston, Rutherford, Ross, Hay, Summers, Chalmers, Tomlinson. The instructors were Messrs. G. W. Beatty, W. Roche-Kelly, and C. B. Prodger, the machines in use being Beatty-Wright dual-control and single-seater.

Mr. Cooper took his certificate on Friday, when all other flying had been suspended owing to bad weather; this speaks well for Mr. Cooper's ability as a pilot and the training he has received.

Exhibition flights were given by Messrs. G. W. Beatty and W. Roche-Kelly on Thursday and Sunday.

**Hall School.**—Last week, pupils rolling: Messrs.

Minot (50 mins.), Mason (40), Snowdon (20), Cook (10), Mason (36), Furlong (8), Hatchman (5), Mitchell (12), all on No. 3. Making straight flights: Hill (8) at 10 ft. high on No. 1. Circuits and eights: H. F. Stevens on No. 2 at 800 ft. for half an hour; also practising landings.

**Brevet** of the week: On Friday, H. F. Stevens completed the full certificate tests in exceptionally good style, taking height test at 800 ft. with faultless *vol plané* from 600 ft. with engine stopped.

Pupils flying with instructor: Messrs. Horner (15), Brooker (10) mins. each with Messrs. Moore and Hall on tractors No. 2 and 4 respectively.

Instructors: J. L. Hall and J. H. Moore.

**London and Provincial Aviation Co.**—Friday last week, school out at 8 a.m. Mr. P. G. Allen rolling, M. Deschamps straights. Mr. J. A. H. Crooke after some practice took an excellent certificate.

On Saturday, Mr. W. W. Smiles half circuits and circuits; Mr. P. G. Allen straights; Mr. J. A. Turner rolling. Weather generally bad all week.

**Ruffy-Baumann School.**—Friday, last week, on 45 Caudron doing straights: Bell (20 mins.), Roobaert (16), Jackson (12), England (12), King (12), Sykes (12), Cole (8), Blandy (12). Mr. Kenworthy doing circuits (8).

On Saturday, on 45 Caudron, Roobaert (8), Bell (8),

Jackson (4), Sykes (8), King (8). E. Baumann out on 60 Caudron with pupils.

On Sunday, E. Baumann out on 60 Caudron with Mr. Winchester and other passengers.

Instructors: E. Baumann, James Brothers, and Virgilio.

### Northern Aircraft Co., Ltd.

The Seaplane School, Windermere.—Flying last week on Wednesday, Thursday, Friday, Saturday and Sunday. Instructors: W. R. Ding, C. L. Pashley and

### FLYING AT HENDON.

THURSDAY afternoon of last week was too windy to allow many flights being made, and it was not until late in the afternoon that M. Osipenko got going on the 50 h.p. G.-W. school 'bus. Previous to that, however, the visitors—and there were quite a decent number—were able to see F. W. Merriam make test flights on the 100 h.p. (Anzani) Handley-Page biplane, which has just been rebuilt. Some of the public had evidently studied the various posters showing types of German and British aircraft, for we heard several remarks passed on the similarity of the H.P. 'bus to German Taubes and D.F.W. That, by the way. Anyway, Mr. Handley Page has designed a first-class machine. At about 6.30 René Desoutter took up a new 100 h.p. (Anzani) Caudron and put it through its acceptance test. In this it was entirely successful, for it not only showed a good turn of speed, but remarkable climbing capabilities—roughly, 7 mins. for the 3,000 ft. Towards the end of the evening J. H. Moore carried his first passenger, M. G. Smiles, on his 45 h.p. L. and P. biplane, which he has just recently bought. A little later he took up another passenger.

J. Lankester Parker. With instructors: Flight Lieut. Atherton (62 mins.), C. A. Barber (22), D. S. C. Macaskie (12), N. H. Mackrow (24), F. H. M. Mackintyre (25), H. P. Reid (38), G. S. Railton (28), J. F. Ridgway (19), H. Robinson (28), H. Slingsby (46). Figures of eight alone: A. Buck. Machines in use: Dual-control Avro, 50 Gnome, and N.A.C. pusher monoplane, 80 Gnome. Messrs. Ding, Pashley and Parker were out several times testing, and a number of passengers were carried on Sunday.

### FLYING AT HENDON.

As we have stated on a previous occasion, this machine flies exceptionally well, and is a splendid climber, whilst its new owner loses no opportunity of bringing out its good points. G. W. Beatty, W. Roche-Kelly, and G. Bransby Williams then started instruction on the Beatty biplanes. It was just as it was nearly dark that the last-named pilot and his passenger had a narrow squeak from what might have been a nasty accident, for when rounding the corner of the aerodrome near the Hall sheds, the engine suddenly seized. They were only some thirty or forty feet up, and before the pilot could nose the machine down, it fell, making a complete turn in so doing, and the left-hand wing tip striking the ground swung the machine once again before it finally "folded up." It was with some relief we saw two figures emerge from under the wreckage, and on arriving at the spot it was soon ascertained that pilot and passenger received no more than slight cuts and bruises, whilst the machine, though partly "dismantled ready for transport," was not so badly damaged.

Once again the wind hampered the flying exhibitions.



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AT THE GRAHAME-WHITE SCHOOL, HENDON. SOME PUPILS AND INSTRUCTORS.—Standing (left to right): Flight Sub-Lieut. E. A. de L. de Ville, Flight Sub-Lieut. M. Hood, Instructor Marcus Manton, Instructor H. G. Russell, Mr. A. Murray Ross, Instructor A. E. Wright, Flight Sub-Lieut. J. F. Hutchinson, Flight Sub-Lieut. A. F. Jacob. Seated (left to right): Flight Sub-Lieut. J. F. Potts, Flight Sub-Lieut. H. S. Kerby, Flight Sub-Lieut. M. A. Simpson, Flight Sub-Lieut. E. C. Bingham.

on Saturday afternoon, although the fine weather brought together a large attendance. The first out was M. Osipenko, who put up a fine exhibition on the 50 h.p. G.-W. school 'bus. Marcus D. Manton took up the same machine immediately after, and ascending high up, executed some of his old stunts. Osipenko and Manton then gave bomb-dropping demonstrations, whilst J. L. Hall ascended on his 45 h.p. Caudron, and made a high flight with steeply-banked turns. F. W. Merriam also made a flight on a 70 h.p. Maurice Farman, and later on J. S. B. Winter went up on the G.-W. 'bus. After this no more flying took place, except for two short test flights by G. W. Beatty and W. Roche-Kelly in Beatty biplanes. One of the visitors on this occasion was Mr. John Redmond, M.P.

On Sunday the aerodrome presented an appearance reminiscent of older days, for there were many visitors in the various enclosures and numerous cars in the paddock,

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## EDDIES.

I WONDER how many readers of FLIGHT will not remember Mr. Lewis W. F. Turner, whose handling of the Caudron biplanes was one of the features up at Hendon in the good old days. Mr. Turner was one of the first civilian pilots to join the Royal Flying Corps at the beginning of the war, and it is good hearing to learn that he has now been given a commission as second Lieutenant. It rests with the Fates and the powers that be as to where his next pitch will be, but it seems reasonable to suppose that a pilot of Turner's experience will not be long before he is out and doing at the front. At any rate, if it were up to me to decide, he would pretty smartly be installed in the seat of a good machine, well loaded up with bombs, with orders to make a bee line for some German point of military importance. For did not Turner win all the bomb-dropping competitions held at Hendon in the days when bombs were filled with flour instead of the various forms of bric-à-brac with which in these stirring days it is customary to fill the modern "visiting cards" of the aviator? Well, whatever mission falls to Turner's lot, he may be relied upon to get there if it be within the power of a human to do so. One good wish I send him is that may he never suffer from engine trouble! The rest may safely be left to him.

x x x

Things are going well up at Lake Windermere, where the activity of both school and works is increasing daily. Lately the latter have been busy with several alterations

whilst a large number of the National Guard added to the ranks of the military already present. Although the wind was still rather strong, there was plenty of flying. M. Osipenko made numerous flights on the 50 h.p. G.-W. school 'bus, as well as on the 70 h.p. G.-W. biplane, with passengers. He also gave a bomb-dropping demonstration on this machine. Marcus D. Manton also carried many passengers on the latter machine. J. S. B. Winter took up a passenger on the 50 h.p. G.W. 'bus, and E. Baumann was out on the 60 h.p. Gnome-Caudron, at one time taking as passenger Mr. Clarence Winchester, who took his ticket at Shoreham last year. G. W. Beatty and W. Roche-Kelly both gave exhibitions of banking and took up passengers on the Beatty biplane. Shortly after 4.30 the wind increased in violence, until by six o'clock it was in the neighbourhood of 40 miles per hour, which, for air work, brought the proceedings to a close.

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to the pusher monoplane, which has had her whole *empennage* re-designed, the elevators and rudders being of much larger area, whilst a rather daring experiment in float construction has been attempted. Instead of the usual woodwork, welded steel has been employed for the bottoms and sides of the floats. On Saturday she was ready for trials, and Mr. Rowland Ding took her up to 3,000 ft. at the first attempt. Her behaviour on the water was all that could be wished for, and the new float construction seems to answer its purpose, for I hear that on examining the floats after the machine had been resting on the water for three days and nights, never a sign of moisture was to be found inside.

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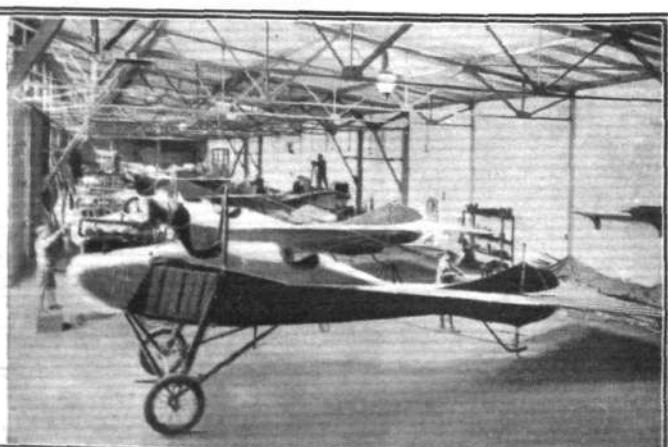
Dropping in at the Ruffy-Baumann school at Hendon the other day, I found the ante-hyphen partner just returned from a trip to France where he has been foraging about for Gnome engines. He told me that he had managed to bag a goodly number of 50 and 60 h.p. Gnomes, some of which are expected to arrive shortly. In consequence the firm's works are hard at it on new machines, so that the present number available for school work should soon be considerably augmented.

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The life of America's most popular aviator, the late Lincoln Beachey, has not been devoid of amusing episodes, of which the American aeronautical press has printed



On the left a view from above of the Rumpler aeroplane works at Johannisthal, Berlin, and on the right a view of the erecting shop.



quite a batch since his untimely death. In their issue of April 15th our New York contemporary *Aeronautics* sets forth the following: "Beachey had been doing his usual dips, spiral glides and other stunts that were Beachey's delight, and on landing he heard a sneering voice at his side. 'Say, are you Beachey?' a tough-looking guy asked. 'Yes,' was the reply; 'why?' 'Gee!' laughed the fellow, 'I t'ought youse was some crack flyer. Say dese odder guys has got it all over youse when it comes to flyin'. Why youse can't even fly straight!'"

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On another occasion Beachey was compelled to land quickly, and decided on a nice flat field, surrounded with a fine wall, and enclosing some imposing-looking buildings. He miscalculated, and came to earth just outside the wall, and in front of a large iron gate. A lot of nondescript-looking people came running down to the gate, and as Beachey dusted himself a bit, one old fellow, grinning broadly, exclaimed mockingly: "Say you feller, ye lit on the wrong side o' the fence, didn' ye?" It was the outside of a lunatic asylum he had struck!

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I have received a most tantalising communication. Why tantalising? I will tell you. A friend who is at present in Paris, or at any rate "somewhere in France," has succeeded, by what means I know not, in getting a letter loaded with interesting news at the rate of — lbs. per sq. in. past one of those austere critics whose pleasant occupation it is to open people's letters and cross out all the really thrilling items, leaving only the we-are-all-well-and-hope-to-hear-the-same-from-you-part of it for the quenching of the poor addressee's thirst for information. Now so far so good. Having read the letter, my first thought was one very natural to a newspaper scribe, one of satisfaction at having got hold of some special tit-bits of news. But my elation is likely to be but short-lived, as I realise that before I can get my MSS. safely into the hands of the compositor two Argus-eyed guardians of the war secrets of the Empire will have to be circumnavigated, namely, the Editor and the Press Censor. I can see with my mind's eye my carefully-compiled matter mutilated out of all recognition, and therefore if the little fragments which succeed in passing through these two sifting processes be less startling than my readers may look for, well, blame the editorial chair and his co-conspirator. I noticed the former the other day engrossed in the details of the conviction of some shocking criminal who had innocently sent forward some statement to his newspaper that he had seen—well, something, down somewhere on the South Coast. The moral is obvious. My Editor says he'll think it over, and at least find out first what prison rations are. So here goes.

x x x

Out in France my correspondent had the pleasure of meeting two of our old friends from Hendon. One of these was Second-Lieut. F. G. Dunn, who was not exactly lazing at the job of taking Moranes from Juvisy out to the front. Dunn makes the journey—oh, well you see if I were to state how many times a day he makes the trip, the Germans are such deep mathematicians that some learned professor might set about working out by a series of complicated equations the output of the Morane factory, should by any chance a copy of the journal of which I have the honour of being a contributor fall into his hands. At any rate, the frequency is highly satisfactory. The other Hendon favourite whom my friend met is Caporal Pierre Verrier, who has now been

fitted with wing-tip skids in the form of walking-sticks, which, however, he expects to discard very shortly. Verrier is still bubbling over with merriment, and is trying to get permission to fly Farmans from Buc to the military aerodrome at—there, I nearly put my foot in it again, in order to get his "hands" in a bit again before going on active service.

x x x

While knocking about the various aerodromes, my correspondent has had an opportunity of seeing a number of the French machines, and the following are a few impressions of some of them. The Farmans are as usual going very strong, and of them little need be said, as their well-tried-out qualities are patent the world over. The Morane parasols are about the only French monoplanes that have survived the trying conditions of actual war service. Of the monoplane firms Nieuports are doing rather well with their new biplane, described in *FLIGHT* a short while ago, and the Deperdussin works are hard at it with a highly original biplane, details of which, however, for the moment must be veiled. The Voisins are very extensively used as fighting machines, and last, but by no means least, the Caudrons have gained such popularity that many of the French constructors are busily engaged turning out these very handy flyers. It had to be, as the demand was far beyond the capacity of the various Caudron factories, in spite of great extensions. But even then the Caudron brothers are not resting on the laurels won in the past and present, but have in their *leisure* (save the mark!) time turned out a new type of biplane, which, according to my correspondent, looks likely to outclass by far the existing types. Of other interesting items mentioned in the letter . . . (Thanks, that's enough for this week.—ED.)

"AOLUS."



Second Lieutenant J. R. Wallace, who was killed in action at Ypres on April 22nd. He was the youngest son of Mr. Roger W. Wallace, K.C., for many years Chairman of the Royal Aero Club.

## THE SCREW PROPELLER.

By F. W. LANCHESTER, M.Inst.C.E.

(Continued from page 306).

ON reference to Fig. 7 it will be at once evident that the so-called chord angle, as measured from an actual aerofoil (or propeller blade), is a quantity entirely without meaning ; the leading edge may be curtailed to a greater or less degree, or the trailing edge may be pushed out further or less far along the lines of flow in the wake, without affecting the dynamic value of the aerofoil in any measurable degree, but with as many different so-called chord angles as the variations made. The chord angle of hypothesis, which is equal to  $\eta/2$ , has no real relation to the so-called chord angle, and is a quantity which must either be given by the designer, or calculated from the dynamic properties of the actual foil on the lines laid down in the author's "Aerodynamics," or in accordance with the newer régime discussed in his recent paper.

11. We may now revert to the main subject. We may allow that in view of all the conditions, the rotor efficiency cannot be as high as theory indicates as its maximum ; probably, if we take it that efficiencies of the order of 85 per cent. are possible, we shall not be far from the mark. It must be recalled that the term efficiency in the present connection is an altogether different matter from that with which we have to deal in the general theory of the screw propeller ; it does not represent any ultimate work done, except in the form of the kinetic energy represented in the downward wake, so that there is nothing contrary to established experience, even though the full theoretical efficiency of over 90 per cent. should be attainable.

In the case of the aerofoil of a flying machine, we know that after all other considerations have been taken into account there remains the factor of aerofoil weight as tending to curtail the area which should in practice be found most advantageous ; now in the case of the helicopter it is this self-same question of the aerofoil weight, or rather the rotor weight, which almost entirely determines the best diameter to use ; were it not for this factor the power required could be reduced indefinitely by progressively increasing the diameter ; this is clear from equation (1).

If, for the purpose of illustration, we suppose the total weight it is required to lift to be one ton, there should be no great difficulty in designing a rotor of 50 or 60 ft. diameter within the permissible weight which could be assigned to that part of the machine. The conditions would indicate a "monoplane" structure of, say, 56 ft. length, about 6 ft. wide in the central portion, tapering to about 3 ft. at the extremities, the two blades thus being embodied in a single structural member. Calculating on the basis of equation (1), the weight sustained per h.p. expended in the downward motion imparted to the air is approximately 40 pounds, and if we allow for an energy loss as due to a value of  $Q = 1.5$ , a reasonable allowance to make, the weight per h.p. will be 40 divided by  $\sqrt{Q}$ , or approximately 32 pounds, or 70 h.p., for the one ton weight total. If, now, we take the rotor efficiency, to be on the safe side, as 75 per cent., we find the total required to be between 90 and 100 b.h.p. The author is firmly of the belief that a machine designed to the dimensions given, and in accordance with the requirements of theory as herein laid down, would lift satisfactorily if driven by reasonably efficient gearing and a power expenditure of 100 b.h.p.

There are, we know, several problems in connection with the direct lift machine beyond that of sustentation which need to be solved before any such machine can be deemed even an engineering success, but these fall rather outside the scope of the present paper. There is, for example, the question of rotational anchorage : evidently some provision is needed in any actual design to prevent the car rotating instead of the rotor ; obviously two rotors having reverse rotation offer a simple solution, and here there appears to be a possibility of an actual improvement. Thus, if two rotors of opposite hand be arranged on concentric shafts a large portion of the energy otherwise lost in rotational wake may be recovered. The author has not pursued the matter further ; an investigation to cover the condition in question would be an affair of some length.

12. On looking into the various schemes for direct lift which have been proposed from time to time, it is quite clear that owing to a want of appreciation of the principles involved, the conditions of least power expenditure have not been complied with. Thus, we are familiar with designs in which are embodied members fashioned after the manner of an American windmill, with an incredible multiplicity of blades, also with machines with fundamentally inadequate rotor area, and others with other defects of an equally detrimental kind.

One of the standard methods of miscalculating a helicopter is to figure the lifting value of the blades on the assumption that they are fully analogous to the aerofoil of a flying machine, using the established aerofoil data for the purpose ; the fact is entirely ignored

that ultimately the lifting reaction is tied down by the Newtonian principle, that is to say, as due to the downward momentum of the air passing through the circular area swept by the rotor blades, in accordance with the teaching of Rankine and Froude. All question of blade interference is thus ignored.

Summarising the position, we may take it that there is no present prospect of making a *direct lift* machine without a considerably greater expenditure of power than that required for a flying machine of ordinary type of equal weight, or in the alternative, should this be achieved, it can only be done by the adoption of a diameter far greater than the span of a flying machine of equal weight, the diameter of rotor required being in the region of twice the span of the machine of ordinary type. At the same time, unless there are unaccounted losses of efficiency of unsuspected magnitude, it is equally clear that the *direct lift* machine is, as a problem in engineering, capable of present-day solution ; whether the problem, when solved, will result in a machine of any possible value, military or otherwise, is quite another and in itself a very debatable question.

PART II.—*The Screw Propeller under the Conditions of Maximum Efficiency.*

13. The screw propeller under the conditions of maximum efficiency may be considered and treated as a special case. In the general treatment it is necessary to take account separately of the loss due to the axial or direct (rearward) velocity component and that due to the circumferential or rotational component, in addition to the skin-frictional or direct blade loss. So long as we confine ourselves to the condition of maximum efficiency, the whole problem is vastly simplified ; it is demonstrated in the author's "Aerodynamics" that for this particular condition the whole of the losses may be lumped into one as expressed by the *least gliding angle*, or least *resistance/lift* coefficient of the blade, considered as an aerofoil adapted to move in the helical path.

The method of treating the blade of a propeller as a number of annular elements is originally due to the late Mr. W. Froude, whose paper of 1878 is summarised in White's "Naval Architecture," p. 606 (3rd Ed.). The present author, working on a similar basis ("Aerial Flight," Vol. I, Chap. IX), has obtained values for the *pressure/velocity*<sup>2</sup> relation of least resistance for the different annular elements of the blade, and has worked out a rational method of blade design in accordance with this relation ; curves of efficiency also are obtained based on the proved constancy of the minimum gliding angle, the whole of the real complexity of the problem being by these means evaded ; it has, however, to be frankly acknowledged that the treatment as such is that of the special case, and can only be applied with a certain amount of "interpretation" when the essential conditions of maximum efficiency are departed from or are rendered impossible by the limitations imposed.

One of the most interesting of the actual results reached by Mr. Froude is that the condition of maximum efficiency, that is to say, the most efficient annular element of a blade whose efficiency is everywhere maximum, has an angle of 45°. The author in his investigation obtained a very similar result, namely, that the most efficient element of the best possible blade will have an *effective pitch* of 45° *less half the least gliding angle*. Now these two results in any case are in close accord, for the least gliding angle is probably between 0.05 and 0.10 (radians), or, say, between 3° and 6° ; hence the author's result is in fact that the best *effective pitch* angle is between 42° and 43.5°. In order that the matter shall be quite clear, plottings of the curve of efficiency are given in Figs. 8 to 13 for values of  $\gamma$  the gliding angle being (in radians) from 0.05 to 0.10 inclusive ; in the figures the radius of the propeller in terms of pitch is given by *abscissae* and the *efficiency* corresponding to these radius values is given by *ordinates* ; the angles corresponding to the *abscissae* values of pitch ratio are given as an irregular scale. It is to be pointed out that both the *radius/pitch* values and the corresponding  $\theta$  values relate to the *effective pitch* and the *effective pitch angle*, in other words they represent the motion of the propeller as if the fluid were a solid and the gliding angle a certain constant angle of friction. This analogy is, for the purpose of quantitative deduction, complete, and the diagrams may be applied (and have been so applied by the author) to the representation of the efficiency of screw gear or worm gear ; the analogy is due to the fact (which the author believes he was the first to demonstrate) that the least gliding angle as a function of velocity is approximately constant.

Now the probability is that Mr. Froude was not dealing with the *effective pitch angle*, but rather with what is sometimes termed the *true pitch angle*, so that there is no reason to suppose that the difference between his result and that of the author represents any real discrepancy ; the difficulty is to satisfactorily define the *true*

pitch angle. The conception is, we may say, founded on the idea of a screw which is a true helix, and when pterygoid sections are employed in the design of the blades it is difficult to fix any definite physical feature of the blade as giving a measure of the pitch angle. The difficulty is exactly comparable to that of the *chord* in wing form discussed in Part I of the present paper.

If we take the case of an aerofoil designed to the condition of least gliding angle, then we know that the gliding angle must approximate closely to the trail angle of the primary camber  $\eta$ , for the dynamic reaction may be represented by the angle of the *hypothetical chord*, which is  $\eta/2$ , and under the condition of least resistance this is half the total. ("Aerial Flight," Vol. I, § 164.) Two proofs of this may be offered; firstly, there is the obvious fact that the curvature of the primary camber represents in reality the deflection of a current—that defined by the peripheral area—and implies a uniformly applied acceleration and a uniform pressure distribution; hence, the mean normal whose inclination to the vertical is  $\eta/2$  gives the direction of the resultant reaction. Secondly (and really the better proof), a dynamic demonstration may be given. (Part IV.) Taking, then,  $\eta$  as equal to the gliding angle, and assuming Mr. Froude's  $45^\circ$  as being the angle of the *hypothetical chord*, we find that the author's result and the previous result of Mr. Froude's analysis are identical, for half the gliding angle may be expressed as  $\eta/2$ , and, adding this to the author's value, we come back to the  $45^\circ$  of Mr. Froude, Fig. 14. With reference to Fig. 14, it is well to point out that the equality of  $\gamma$  and  $\eta$  only apply provided the condition of least resistance be assumed (direct resistance = dynamic resistance), also that the camber curve shown is definitely the *primary camber* and has no physical existence in the final blade form.

14. The basis on which the author derived the curves given in Figs. 8 to 13 is worth mention as bearing on the more complete investigation and solution given in Part III of the present paper. In Fig. 15 the gliding angle  $aOb = \gamma$  is shown as superposed on the angle of effective pitch  $dOb = \theta$ ; now if we, for the time being, regard the problem as that of a flying machine climbing steeply,\*

\* Incidentally the author's solution for maximum efficiency is also the solution of the most economical climbing angle.



#### Zeppelin Bomb Presented to the King.

THROUGH the Marquis of Tullibardine, Chairman of the Royal Aero Club, Mr. William Dunsmore, of Bedlington, presented to H.M. the King an incendiary bomb dropped on his farm by the Zeppelin during the recent raid on the North-East Coast. In acknowledging the souvenir, Lord Stamfordham said:—"The King was much interested in having his first specimen of these bombs, and he thinks it was very kind of Dunsmore, on whose farm the bomb was dropped, to allow it to be sent to His Majesty. Evidently, from your account, the enemy did his best to damage the house, and the King congratulates him on the fortunate escape of himself and his property."

#### The Anti-Aircraft Corps.

REPLYING to questions put by Mr. Fell in the House of Commons last week, Mr. Macnamara said that at the first formation of the Anti-Aircraft Corps there were 100 special constables, no record of whose ages could be found. Up to March 31st last 45 per cent. of the men of the corps were of non-military age and 55 per cent. of military age, a large proportion of the latter coming from the Office of Works and other Government Departments, who could not release them for more active service. After the reconstruction of April 1st 46 per cent. were of non-military age and 54 per cent. of military age. Large numbers of those of military age were medically unfit for more active service. It was pointed out that 100 discharges had been granted to officers and men to join more combatant units of the forces since the corps first started in November, and that over 200 of those in the corps had served or were serving abroad with the various anti-aircraft detachments. Any member of the corps who wished to join a more combatant unit was at once released for this.

#### Lord Kitchener and R.A.F. Workers.

FOLLOWING on the recent visit of inspection to the Royal Aircraft Factory at Farnborough, Lord Kitchener sent the following message to the workers. This has been printed and a copy given to each employee:—

"I am pleased to have the opportunity of expressing my appreciation of the excellent work which is being done by the employees, male and female, at the Royal Aircraft Factory. I am sure that they are willing to put up cheerfully with discomforts and difficulties, both in connection with their long hours of work and in the matter of housing, because they appreciate the fact that work on war munitions, such as aircraft and their parts and accessories, is of vital importance to the British Army. Their work is of real value,

then an applied force of propulsion sufficient to climb the gradient  $Oa$  if no resistance of any kind were experienced, the work being represented by the change of altitude  $da$ , will, under the real conditions, result in the machine climbing the gradient  $Ob$ , the actual gain of altitude being  $db$ ; thus the efficiency is  $bd/da$ . On the basis of the independent treatment of the annular elements of a propeller, each element is supposed represented by a diagram similar to that given in the figure, and thus each element will have an efficiency proper to its own values of  $\gamma$  and  $\theta$ . The author has shown that the efficiency is given by the expression  $\frac{\tan \theta}{\tan (\theta + \gamma)}$  and its value is

maximum when  $\theta = \frac{90^\circ - \gamma}{2}$ . Now the angle  $\theta$  is definitely re-

lated to the *radius/pitch*, whereas the angle  $\gamma$  is, within the limitation imposed by the condition of minimum value, under the control of the designer; hence the author has from the outset given the preference to the angle  $\theta$  as a datum, that is to say, the angle of *effective pitch* rather than the blade pitch, which depends upon some arbitrary definition and in any case includes a function of the variable angle  $\gamma$ . A propeller designed on the basis of the  $\theta$  angle includes its slip factor in the design, and in any case the quantity which the naval architect terms "slip" requires very careful definition before it can be regarded as one of scientific application. If the hypothetical chord of the blade were something tangible which could be measured, the blade pitch could be appropriately defined as the helical pitch of the chord; but we have already seen, with reference to Fig. 7, that the real or "so-called" chord has no necessary relation to the hypothetical chord, and is a measurement of no dynamic import. The difficulty of basing propeller theory on the blade pitch is again complicated by the fact that the designer may elect to vary his  $\gamma$  angle according to some arbitrary scheme that may be found advantageous in practice, and so the blade pitch will vary from point to point in a manner that will defy systematic treatment. For the foregoing reasons the author regards any attempt to rationalise propeller theory on any basis other than that of effective pitch as tending to chaos and foredoomed to failure.

(To be continued.)



and they can all feel that by their exertions they are helping the troops in the field."

#### Fatal Accident at Gosport.

It is with great regret that we record the fatal accident which occurred at Fort Grange, Gosport, on Saturday evening, by which Flight Sergeant W. McCudden lost his life and Second Lieut. N. Read, R.F.C., who was a passenger on the Blériot monoplane, was seriously injured. According to the evidence given at the inquest it appears that the engine was working badly, due to the carburettor flooding, and owing to the loss of speed the machine side-slipped. As the machine was only about 100 feet up there was not sufficient room to overcome the movement. It was stated that Sergeant McCudden, who was an experienced pilot, was in charge of the machine at the time and giving instruction to Lieut. Read. A verdict of "Accidental Death" was returned.

It was announced that Lieut. Read was making a good recovery.

#### Aerial Attacks on Ships.

A WALMER pilot, Mr. George Sinclair, on arrival in England last week, reported that a German seaplane had discharged three bombs at the American S.S. "Cushing," which he was piloting to Rotterdam. One of the bombs fell on the stern rail scattering metal all over the deck, but no damage was done.

The trawler "Ivis" reported at Lowestoft, on Tuesday, having sighted a Zeppelin at 11.30 a.m. on Monday morning. It was proceeding in a westerly direction, but when a stiff breeze sprang up it turned round and went back.

In the wireless news sent out from Berlin it was stated, that "on Monday a German naval airship fought in the North Sea with several English submarines and it dropped bombs upon them. One of the submarines was sunk. The airship, although fired at, was not hit, and returned in safety."

#### The Capture of Garros.

ACCORDING to accounts printed in German papers, it appears that the capture of Garros was due to motor trouble. After coming down to forty metres to drop bombs on a railway train, two of them falling on the engine, he was fired at and climbed to a height of 2,500 metres, when the motor stopped. He made a *vol plané* and landed in the neighbourhood of Hufte. Directly he alighted he burned his machine and then sought refuge in a cottage, where after a long search the Germans found him. It appears that he is now in a special detention camp at Magdeburg.

## AIRCRAFT AND THE WAR.

MR. BEACH THOMAS, writing to the *Daily Mail* from Northern France on Tuesday week, said:—

"Our airmen, who have faced the bitter north wind with unabated pluck, return from their tours above the thundering artillery with extraordinary pleasure at the difference between this battle of Ypres and the first battle in October last. It is true that they see the Germans pressing on in numbers behind the mephitic vapours and foul dust that they raise from laid pipes and—in different but equally poisonous form—from bursting shell. But it is no thin line against which they now hurl themselves. The days of that terrible contrast—pictorially visible to our airmen in the early days—are over. They see equality, if not the preponderance that we must yet ensure."

The *Times* correspondent at Petrograd, writing on April 27th regarding the naval action against the Bosphorus forts, said:—

"The Russian fleet fought at much closer range than formerly, and it is believed that it inflicted heavy losses, which assumption is borne out by the observations of seaplanes and of an explosion at Uzunga."

In the German wireless news of the 28th ult., there was the following:—

"Yesterday morning an airman flew over Friedrichshafen, coming from a westerly direction. He was at once fired upon, but dropped six bombs, two of which did unimportant damage. One man had his hand hurt. The airman escaped in an easterly direction, but he was noticed to be wobbling appreciably as he flew away."

Writing on the 28th ult., the *Daily Mail* correspondent at Vevey, Switzerland, said:—

"A despatch from Romanshorn (Lake Constance) says that at eight o'clock this morning a flotilla of six Anglo-French aeroplanes was signalled as approaching Friedrichshafen."

"A terrific cannonade was heard from the Swiss shore of the lake, and a German military balloon armed with machine guns was observed above the Zeppelin sheds."

"According to another report, only one airman reached Friedrichshafen. He circled above the sheds for thirty minutes amid a terrific hail of shrapnel and rifle fire and dropped six bombs."

"The damage done to the airship sheds is unknown. The airman escaped unhurt."

The special correspondent of the *Daily Telegraph*, writing from Berne on the same day, said:—

"Early this morning, before seven o'clock, when I was still at Basle, I was awakened by a heavy cannonade on the other side of the Rhine, and was told that a big flying squadron of French and English aviators, which had started from Belfort and passed over Dammerkirch and Altkirch, was flying between Sierenz and Hueningen, in the direction of the Black Forest. After driving out to a spot on this side of the border line, I saw two French aeroplanes passing over Loerrach and flying in the direction of Schopfheim, where they were subjected to a heavy fire from the batteries at Tullingen and other heights around."

"I learned that several bombs had been dropped on Loerrach, Haltingen, and Muellheim, and that damage had again been done at Haltingen. I was also told that between ten and fifteen aeroplanes had crossed the Black Forest over Kandern, and were going in the direction of Ludwigshafen and Friedrichshafen. At Berne I learned that this morning, shortly after eight o'clock, news was received by the Swiss military station at Romanshorn, opposite Friedrichshafen, that a squadron of French and English aeroplanes was heading for the lake. The Swiss commander immediately ordered the taking of military precautions on the church tower and other points at Romanshorn. Finally, about ten o'clock, a heavy cannonade was opened at Friedrichshafen and vicinity, and news was received that six hostile aeroplanes had reached the lake and were circling over the Zeppelin sheds. They were bombarded from the German side, and the sky was dotted with puffs of white smoke from the exploding shells hurled by the batteries at the daring aviators, who were calmly circling at a height of 3,000 yards. The cannonade lasted more than half an hour, without reaching any machine, as none were disabled. Meanwhile, a captive balloon, with machine-guns aboard, rose over the Zeppelin sheds, and began a lively attack on the aerial squadron. A steamer which reached Romanshorn an hour later reported that the combat was still in progress, and that six aeroplanes were attacking the sheds and the captive balloon."

"The latest report from Romanshorn says that one of the six aviators succeeded in getting directly over the Zeppelin sheds,

dropping two bombs, which exploded, but the extent of the damage is not yet known."

In the German report issued on the 28th there was the following:—

"Near Altkirch one of our airmen brought down a French aeroplane."

A correspondent of the *Temps* at Nancy, writing on April 28th, said:—

"A German aeroplane, flying at a great height, passed over the town to-day and dropped three bombs in the central part of the town. Three persons were killed, six were dangerously wounded, while a number of others were less seriously hurt. The hostile aircraft was fired at and was pursued by French aeroplanes, but it managed to escape."

Mr. James Dunn, writing from Rotterdam to the *Daily Mail* on the 28th ult., said:—

"Owing to the damage to important German railway junctions in Flanders by the Allied airmen, the enemy have been hindered in bringing up reinforcements to relieve the exhausted troops."

The *Daily Telegraph* correspondent at Petrograd, writing on the 28th ult., said:—

"In Poland and the Suvalki Government things are still very quiet, nothing more serious than skirmishes and aviation raids being reported. During an attack on Neidenburg by machines of the Ilva Murometz type, ten bombs, of a total weight of thirty pounds (1,080 lb.), were dropped. One single bomb weighed as much as 180 lb. Among the targets actually struck were the railway station, the track near it, and a large public building."

The *Morning Post* correspondent in Petrograd on April 28th said:—

"In retaliation for the serious damage done by several Russian 'Dreadnought' aeroplanes on the railway communications near Soldau, the Germans on Sunday sent a Zeppelin as far as Bielostok, the junction of five main lines. The airship dropped several bombs upon the town without causing any losses."

Mr. Ferdinand Tuohy, writing to the *Daily Mail* from Warsaw last week, said:—

"German aeroplanes continue to visit Warsaw, and are murderously busy, having killed and wounded several civilians in the past month."

The following description of a raid by Allied aviators over German stations near Lake Constance was sent by a *Times* correspondent at Délémont, on April 29th:—

"The population of Basel was alarmed on Wednesday morning by an intense cannonade at the forts of Tullingen, near the Swiss frontier. A French biplane had been descried flying past the place. Soon afterwards 16 bombs fell close to Haltingen, an important station on the railway line which runs north from Basel to Freiburg-im-Breisgau. The engine-house was hit, three locomotives were destroyed, and the railway line was seriously damaged."

"A little later the Swiss troops noted the passage of nine airmen. The reports of the German guns were heard without cessation. Information from German sources states that an English bomb failed to explode, showing that at least one British airman took part in the raid. Fires broke out at the German town of Lörrach, five or six miles from Basel and Haltingen."

"About 9.30 a.m., a lively cannonade was heard at the Swiss town of Romanshorn, coming from Friedrichshafen on the opposite shores of Lake Constance, where the Zeppelin factory is situated. The sound of the cannon was mingled with the rattle of the machine-guns. The Swiss military station of Romanshorn received information of the arrival of French and British airmen over the Zeppelin factories, and from the Swiss frontier a German captive balloon armed with machine-guns could be seen. The cannonade lasted for half an hour."

"Six bombs were thrown on the Zeppelin works—without serious results, according to German reports. None the less, two loud explosions were heard from Switzerland. The airmen were able to get away without being hit."

The *Times* special correspondent at Mytilene, writing on April 29th, said:—

"Our aerial fleet is rendering valuable assistance, chiefly by locating the enemy's positions, and also by destroying the important bridge over the Scamander (Mendere), near Ezine, and the large depot of arms in that town."

"A report was current to the effect that bombs thrown by one of our aeroplanes had wounded 10 persons at Maidos."

The *Morning Post* correspondent at Petrograd, writing on April 29th, said:—

"German Zeppelins and aeroplanes are scouting far inland once more, while Russian 'Dreadnought' aeroplanes make repeated trips beyond the German political frontiers. There is some doubt whether the Zeppelins are any use as scouts, owing to the enormous height at which they now elect to fly. This happily also renders them ineffective as bomb-throwers. With the shore and fleet operations in the Dardanelles and the analogous enterprise of the Russians against the Bosphorus, the descent from the Carpathians upon Hungary is being carefully timed. To the Dardanelles theatre of war, equally with that of the Carpathians, the eyes of all Russians are now eagerly turned."

Writing from Vevey, Switzerland, under date of April 29th, a *Daily Mail* correspondent said:—

"Squadrons of French aeroplanes have flown over Alsace during the last few days. On Wednesday morning nine machines were seen by Swiss soldiers at the frontier near Bâle. They were met by the Germans with a terrific fire, but apparently none was hit. The nine were later seen returning in the direction of Belfort."

A *Daily Mail* correspondent in Paris on the 30th reported:—

"An Aviatik which flew over Armentières has been brought down by British anti-aircraft gunfire."

In the German report of the 30th ult., there was the following:—

"On the coast enemy airmen are displaying great activity, causing considerable damage to houses at Ostend."

"Near Cornay, east of the border of the Argonne, a hostile aeroplane fell down, the pilot being killed."

"Coast fortifications at Harwich were bombarded last night."

A *Daily Mail* correspondent in the North of France, writing on the 30th ult., regarding the bombardment of Dunkirk, said:—

"The bombardment started early in the morning, and it lasted until about 2.30 p.m., when it ceased abruptly. During nearly the whole period hostile aircraft hovered over the town watching the effect of the shells."

"Dunkirk has suffered considerably since the outbreak of war, as it has been continually the object of air raids, and hardly a day has passed during the last four months without hostile aircraft flying over the town, even though they have not always dropped bombs."

A correspondent of the *Patrie*, writing on Saturday, said:—

"Yesterday and last night Dunkirk was again bombarded. The tocsin rang at six o'clock. In the next fifteen minutes seven 305 calibre (12-inch) shells fell on different points of the city. Meanwhile, an enemy aeroplane flew over the city, dropping flares."

The following was included in the *communiqué* issued in Berlin on Saturday:—

"The enemy yesterday lost three aeroplanes. A British machine was shot down south-west of Thielt, another aeroplane near Wielte, north-east of Ypres, and a third was forced to descend from a hostile air squadron near Niedersulzbach, in Alsace."

In the *communiqué* issued in Berlin on Sunday, it was stated:—

"Yesterday, again, two French aeroplanes were disabled: one was destroyed by shooting near Rheims, and the other, belonging to an air squadron, was forced to land north-west of Verdun."

The following appeared in the *Petit Parisien* of the 2nd inst.:—

"A few days ago four British aviators raided St. Quentin and destroyed a store of German ammunition. Nineteen men of the Guard were killed. The next day the aviators flew over the station and destroyed some goods sheds and a large stretch of the line."

On Sunday the Sluis correspondent of the *Telegraaf* reported the following:—

"Complete quietness prevails around Zeebrugge, and with the exception of the guardships no German war vessels have been seen off the Belgian coast. This morning a German balloon flew over Dutch Flanders. It was vigorously fired upon by Dutch troops, and came down between Draaibrug and Aardenburg. It had no occupants."

Mr. W. Beach Thomas, writing to the *Daily Mail* on Sunday regarding the bombardment of Dunkirk, said:—

"Bombardment at this distance is, of course, 'blind,' even if an aeroplane can watch the results, and the one Taube that flew over the town was certainly too high to make accurate observation possible even with the help of the automatic photograph apparatus which some of the German planes now carry."

"While I am on the subject of the amenities of war, I may say that on several occasions of late German airmen have dropped letters giving news—in some cases delivering autograph letters—of British prisoners in Germany. In every instance our airmen have flown over the German lines to drop a letter of thanks and acknowledgement. The rancour of the fight on the earth is shaken off from the wings of the aeroplane."

In the German Main Headquarters report on Monday, there was the following:—

"A French flying machine landed yesterday at Hundlingen, west of Saargemünd. Both occupants were taken prisoners."

"A German airship squadron attacked the airship hangar and railway station of Epinal yesterday, apparently with good results."

A Turkish *communiqué*, issued in Constantinople on Monday, contained the following:—

"A hostile hydroplane, flying over the Gulf of Alexandretta, was damaged by our fire and fell into the sea, where it was picked up by a cruiser navigating in those waters."

In a message from Rotterdam on Monday evening a *Daily Telegraph* correspondent said:—

"Great activity in Belgium and along the coast by the Allies' airmen is reported in a message from the frontier this evening. A daring raid was made in the very early hours of this morning over Bruges and other places, and bombs were thrown on the railway stations and buildings in enemy use. At five o'clock this morning two aeroplanes, coming from the interior of Belgium, were seen from Sluis. Flying very high, they headed straight in the direction of Knocke, and then as they neared the coast dropped to a lower altitude and threw bombs on the German batteries and other positions along the coast. Both daring airmen were shot at from anti-aircraft guns, many more of which have been placed in position, but neither was hit. They disappeared in a westerly direction."

Mr. Philip Gibbs, in a despatch from Châlons-sur-Marne, describing a visit to the French lines in the Champagne district, and published in the *Daily Chronicle* on Monday, said:—

"'Even war is less horrible now that the sun shines,' said a French officer."

"The sky was cloudlessly blue, but as I gazed up into a patch of it where a winged machine flew high with a humming song, five tiny white clouds appeared quite suddenly."

"'They are shelling him,' said the commandant. 'Pretty close, too.'

"Invisible in the winged machine was a French aviator, reconnoitring the German lines away over Beausejour. Afterwards he became visible, and I talked with him when he had landed in the aviation field, where a number of aeroplanes stood ready for flight. He was a young man with the keen profile of his class and a matter-of-fact manner which made one hide one's hero-worship."

"'They touched her three times,' he said, pointing to his machine. 'You can see the holes where the shrapnel bullets pierced the metal sheath.'

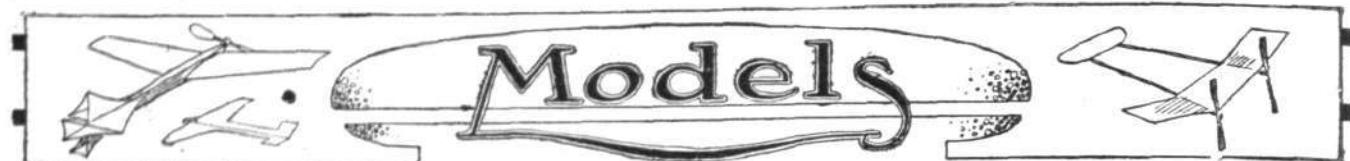
"He showed me how he worked his mitrailleuse, and then strolled away to light a cigarette against the wind. He had done his morning job, and had escaped death in the air by half an inch or so. But in the afternoon he would go up again—2,000 feet up above the German guns—and thought no more of it than of just a simple duty with a little sport to keep his spirits up."

The following appeared in the *Telegraaf* of Monday last:—

"On Friday evening, about half-past nine, two hostile aeroplanes appeared over Essen, the Krupp headquarters, making in the direction of the powder factory, which is about an hour's journey from the city."

"Motor cars with machine-guns hurried to the spot and fired on the aeroplanes, which then disappeared without having been hit, and, so far as can be ascertained, without throwing bombs."

According to a telegram from Karlsruhe, received in Amsterdam on Monday, an enemy aviator dropped eight bombs on a goods train near Rudoeschingen, in the Black Forest. It is stated that a railwayman was slightly wounded, but no material damage was done.



Edited by V. E. JOHNSON, M.A.

**A Gear-Controlled Tractor Monoplane.** By H. SIBLEY.  
THE following particulars and accompanying sketches refer to a small model I have recently constructed, and which I think may prove of interest to your readers. Briefly put, it is a tractor monoplane, fitted with a form of gear control, by which the elevator, rudder and ailerons may be operated automatically during flight. This method of automatic control was to my knowledge first thought of by Mr. W. G. Aston, and given by him in the form of an article, in the first issue of the *Aero* as a monthly paper, as far as I can remember, in 1911.

At that time one of the difficulties of model flying was to get a machine to rise from the ground under its own power, and in the above-mentioned article Mr. Aston gave a method by which he considered this might be accomplished by the use of a gear control,

There is no need for me to refer to this more in detail, as the problem of the r.o.g. model has been solved. I do not know if anyone actually constructed an automatically controlled model at that time; if so, I have never seen any account of such, and do not know whether such was a success or not. Personally, I was chiefly concerned in getting all the power (not very much) out of the rubber motors of my models without putting extra weight and resistance in the form of a gear control, &c.; at that time rubber lubricant had not been invented.

It was only quite recently that I decided to build a model of this description, and using a form of control as described by Mr. Aston.

The good points about this type of control are these: Simple to make, cannot get out of order, easy to adjust, minimum of resistance.

I do not think any lengthy description is necessary as I have made the sketches as clear as possible.

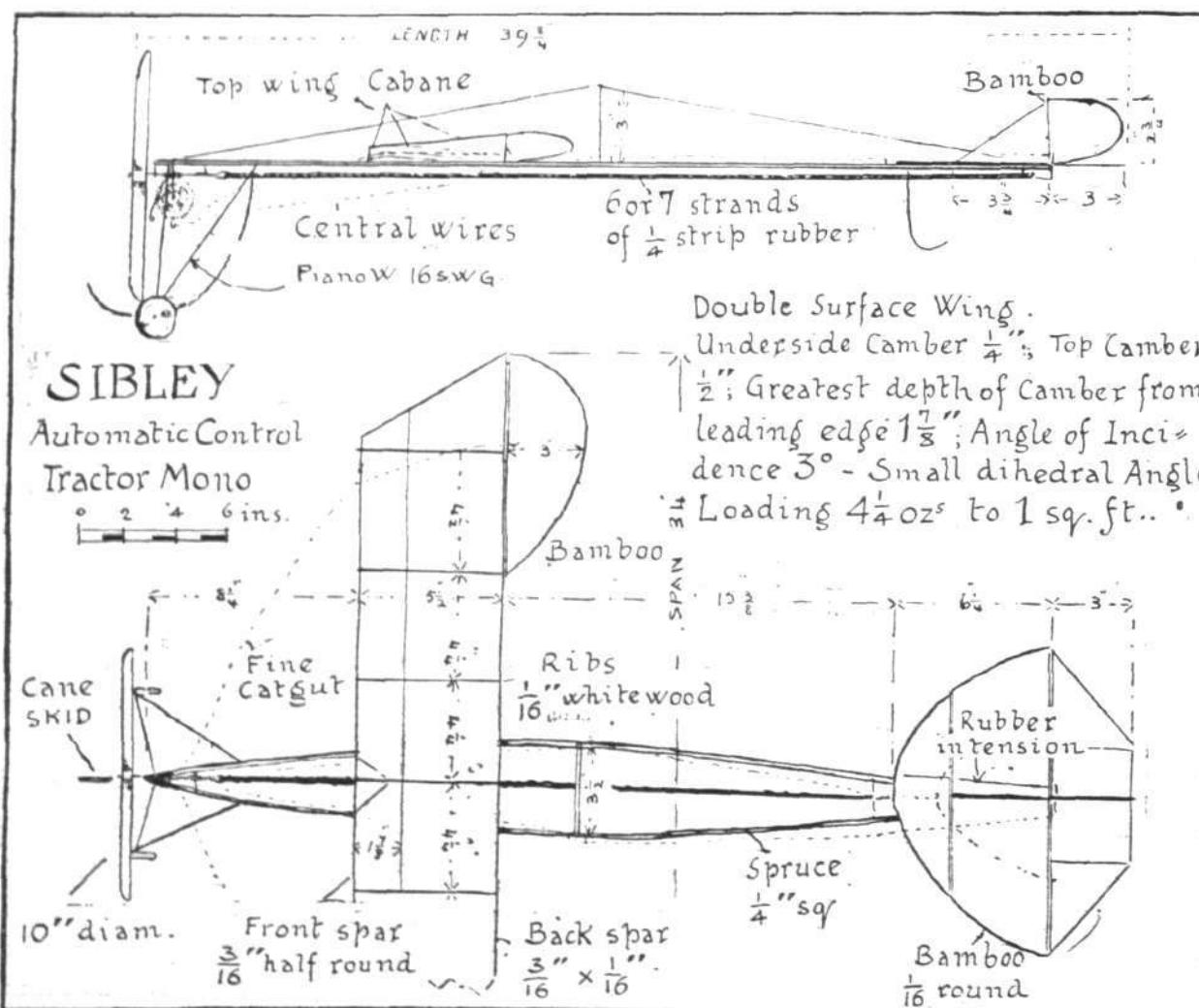
Fig. 1 shows side and front elevation of control gear drawn to half actual size.

The worm gear is made by coiling a piece of mild steel wire round propeller shaft and soldering to the same. [Copper wire answers equally well.—V.E.J.] The wire used for this purpose should be of a suitable gauge to fit in with the teeth of the large gear wheel. The "worm gear," if necessary, may be carefully filed to ensure a good working fit when in mesh with the large gear.

On the model herein described there are fifty-six teeth on the large gear wheel (100 would be more suitable), so that for every 56 revolutions of propeller spindle the large gear wheel makes one revolution.

The wire levers, to which are attached the control wires, are operated by small wire arms soldered to each side of gear wheel.

It will be apparent that the more teeth on gear wheel the longer the time that will elapse before the lever controls come into operation.



**THE SIBLEY MODEL.**—Particulars and weights:—Fuselage, gear control, chassis, tractor screw, 2 1/2 ozs.; tail and rudder, 1/2 oz.; main plane, 1 1/2 oz.; rubber, 1 oz.; total weight, 5 1/2 ozs. With 6 strands of rubber screw gives 1,080 r.p.m., 450 turns = 25 seconds. With 7 strands of rubber screw gives 1,166 r.p.m., 350 turns = 18 seconds. The number of turns was obtained with a moderate wind.

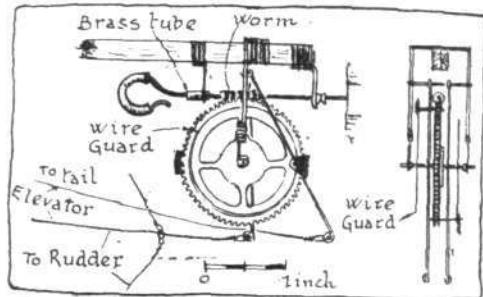
In my own model each lever operates every  $3\frac{1}{2}$  secs. [This is too quick for a duration machine, every 10 secs. would be better.—V.E.J.]

Of the two levers, one works the rudder and *ailerons* combined, the *ailerons* being inter-connected, the other lever operates the tail elevator and is so adjusted that during the time the rudder and *ailerons* are in operation, the elevator has a positive angle, thereby keeping nose of machine down while turning.

After the rudder has operated, the elevator takes a negative angle, so causing machine to climb. A certain time elapses after each set of controls have been in operation, owing to slackness of control wires, &c.

It will be seen that with this form of control one has a large number of movements, each of which may be easily adjusted.

For instance, we will suppose we use the tail elevator control only; in theory, when the elevator is at a negative angle, machine



will climb, and then as the elevator gradually assumes a positive angle, machine is then flattened out at a higher altitude, the operations then being repeated; it would seem that machine would be more efficient than if the controls were fixed (as in the ordinary model).

Again, one could see if the rudder was sufficient to preserve balance while turning, and if not, how much *ailerons* need to be used to preserve balance.

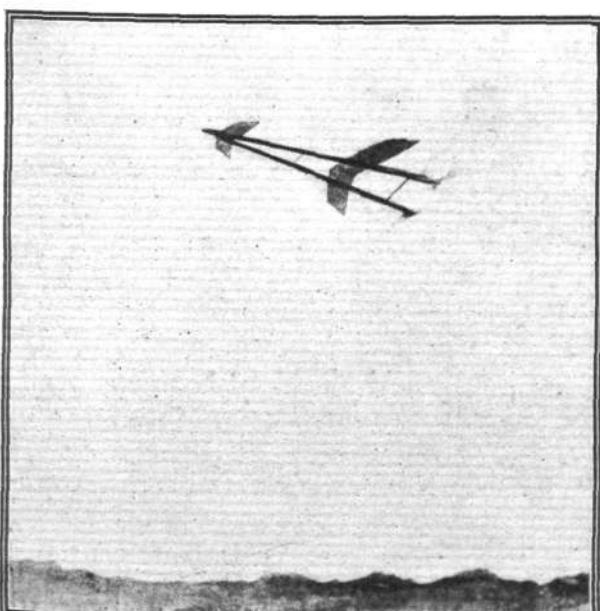
In the way of model "stunts," I think the *chute de côte*, ragtime and switch-backing, &c., would be quite possible.

This kind of control would be the most efficiently used on a larger type of model (say 12 to 20 ozs.), as the gear control could be made lighter in proportion and the power used to work the same would be almost negligible.

I have not as yet tested machine in free flight, but from bench tests I have every reason to think the same will be successful.

The elevator, rudder and *ailerons* work quite smoothly, and apparently with seven strands of  $\frac{1}{8}$  strip rubber, machine will have quite sufficient power; of course, there is the resistance on controls during flight, and whether this will use up the power to any large extent remains to be seen.

The reason I did not test machine before giving a description of



Mr. T. W. Bennett's arrowplane-canard, h.l. model, in full flight, the most consistent flying model of the Liverpool Aero Research Club. The model is fitted with negative tips.

the same was that the tests might not have been successful, and I should not have troubled to have drawn plans, &c., that might, as in the present instance, be of use to others desiring to experiment in this direction.

[We trust that later on our correspondent will let us know the results of the free flight tests, no matter what form they may actually take, success in this direction is, after all, only a matter of experiment.]

#### Model Research Work.

We have received the following interesting communication from Mr. W. E. Evans, the Hon. Sec. of the Paddington and District Aero Club, in reply to an enquiry as to how matters were progressing:—

"Members have been rather slow with compressed-air models; only one has been out flying up to the present—namely, that of Mr. R. Bird. He has had several flights of from 15 to 30 secs. with a 26-oz. model. Lack of rigidity in construction has inevitably ended in many smashes.

"Other members including myself are intent upon research work. One of the first items is to prove which is the faster, a pusher or a tractor. Special models are being constructed for this, so that the head resistance shall not be altered when the change over is made.

"Have you any reliable data concerning the relation of speed to loading? If not, this is another matter we shall have to take in hand. According to Stony Stratford's Club Magazine the speeds for various loadings are given as follows:—

Loading (per sq. ft.)	... 4 oz.	6 oz.	8 oz.	16 oz.	21 oz.
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Speed (m.p.h.)	... 12	15	17	25	30
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"Taking the above figures to be somewhere near correct, I find the speed varies approximately as the square root of the loading.

"Assuming that speed of model necessary for horizontal flight with 4 ozs. loading to be 12 m.p.h., and that the speed varies as  $\sqrt{\text{loading}}$ . It works out thus:—

Loading	... 4 oz.	6 oz.	8 oz.	16 oz.	21 oz.
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Speed as	... $\sqrt{4}$	$\sqrt{6}$	$\sqrt{8}$	$\sqrt{16}$	$\sqrt{21}$
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	= 2	= 2.45	= 2.83	= 4	= 4.58
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Multiplying by 6 =	... 12	= 14.7	= 16.98	= 24	= 27.48
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	or 12	= 14.4	= 17	= 24	= 27.4
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which nearly agrees with	12	= 15	= 17	= 25	= 30
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"But I should think my figures are nearer the correct speeds.

"I am anxious to know whether there is anything in it, because if so propellers of suitable pitch can be fitted to a model straight away knowing the loading and therefore the flying speed."

Referring to the above, the figures given in the Stony Stratford Club Magazine appear to be taken from the writer's book on Model Aeroiplanning, p. 132, § 14, where the following formula and figures are given:—

Formula connecting the weight lifted in lbs. per square foot and the velocity.

The empirical formula  $W = \frac{V^2 C}{g}$ , where  $W$  = weight lifted in lb. per sq. ft.,  $V$  = velocity in ft. per sec.,  $C$  = a constant 0.25 or  $\frac{1}{4}$ ,  $g$  = 32.2 or 32 approx., may be used for a thoroughly efficient model. This gives (approx.)—

1 lb. per sq. ft. lift at 25 m.p.h.	6 oz. per sq. ft. lift at 15 m.p.h.
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21 oz.	30 "	4 oz.	10 "
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The 8 oz. per sq. ft. lift at 17 m.p.h. is not given in the writer's book, but is deduced at once from the formula, and is, as a matter of fact, written in pencil in the copy before me.

It must be remembered the results work out in feet per second. To convert (approx.) into miles per hour multiply by  $\frac{5}{8}$ .

This formula was deduced by me mainly from experiments with Clarke's models—early wooden type—which were, in their form, most decidedly scientific and efficient models. It has frequently been confirmed since to at any rate a close degree of approximation; it never pretended to be anything more. If the Stony Stratford Club have arrived at a similar result from independent experiment it would be a remarkable confirmation of it.

The close agreement with Mr. Evans's figures is very interesting, and it would appear (unless anything be adduced to the contrary) that the conclusion is a safe one. Referring to Mr. Evans's statement, "One of the first items is to prove which is the faster, a pusher or a tractor," we must confess we fail to see how *equally efficient* models can be built so that when the change over is effected the head resistance shall not be altered. We should certainly like some further information on this interesting point.

#### Wireless-Controlled Models.

Mr. Derek Shannon (Olinda, Rhyl) writes us as follows:—"I read your article on 'Wireless-Controlled Models' with interest. I am a member of the Liverpool Wireless Association, and before the war I did a great deal of experimenting with wireless. I have also done quite as much with model aeroplanes, and I should be very pleased to co-operate in any scheme that may be put forward."

## STEEL WIRES.

ONE of the most important components of any type of aircraft is the steel wire or cable employed for bracing, &c., and although stranded cable is generally used for the purpose, solid drawn single wire is sometimes utilised, especially wire drawn to a streamline section. The manufacture of such a wire as this is a matter requiring no small amount of experience, not only as regards the material employed, but also in connection with the dies and machinery required. One firm which has given considerable attention to this branch of metallurgy is Messrs. W. N. Brunton and Son, of Musselburgh, Scotland, who have just issued a little booklet which should prove very useful and instructive to those of our readers who are directly concerned with the constructional side of aviation. It contains prices and particulars, including heat treatments recommended for steels of all classes for rod and wire work, and there is a chart of heat colours with the corresponding temperatures in Centigrade and Fahrenheit scales. Circular section rods from .010 in. to 2.5 ins. in diameter are made as standard in all the various qualities, as well as other common sections such as



Some sections of the drawn wires made by Messrs. W. N. Brunton and Son.

oval, square, hexagonal, &c., while the large variety of other sections which can be drawn in steel, iron, copper, brass or steel alloy can be seen in the illustration, in addition to which arrangements can be made for the drawing of any pattern. These rods are cold drawn to micrometer gauge, those of circular section being put through a special process to obtain absolute uniformity and roundness. The other sections, when not too intricate, can, it is claimed, be drawn as accurately as they can be milled. Special attention is drawn to the "Flying Scotsman" brand of high speed steel (containing about 12½ to 13½ per cent. of Tungsten), which when hardened will, it is said, cut glass easily and retain its cutting edge. In addition to the above information, there are a number of useful tables for the draughtsman showing areas of circles, sizes and weights of wire gauges, &c. Indeed, Messrs. Brunton's catalogue is well worth a study.



## The Advantages of Triplex Goggles.

CURIOUSLY enough, it was only about a fortnight or so ago that we drew attention to the danger when using ordinary glass goggles, in the event of an accident, of splinters of glass entering the eyes of the pilot or his passengers. Now we hear of an actual case which has occurred at a London aerodrome, in which the pilot was involved in a bad smash. He escaped with his life, but unfortunately he has lost his eyesight through his goggles being smashed and the glass getting into his eyes. We can only repeat that an easy way of obviating any such trouble is by the use of goggles with Triplex glass lenses,

which are so constructed that it is impossible for them to be splintered. They can be had in several styles from the Triplex Safety Glass Co., Ltd., of 1, Albemarle Street, Piccadilly, W.

## Titanine Telegraphic Address.

THE British Aeroplane Varnish Co., Ltd., the proprietors of the Titanine, has just registered telegraphic addresses which are not only expressive but should be easily remembered. For the Head Office it is "Tetrafree, Newcastle-on-Tyne," and for the London Office "Tetrafree, Fen, London."



## ENEMY PATENTS RELATING TO AERONAUTICS.

THE following list of British patents which have been granted in favour of residents of Germany, Austria, or Hungary, is furnished in view of the new Patents Acts, which empower the Board of Trade to grant licences under certain conditions to British subjects to manufacture under enemy patents—which licences can be retained after the war—and is specially compiled for FLIGHT by Lewis Wm. Good, Chartered Patent Agent, Enrolled Patent Attorney in the United States, 5, Corporation Street, Birmingham. It is desirable in the first instance to obtain a full copy of the patent specification (price 6d. each patent), and also the latest particulars upon the Patents Register. If any patent listed has been assigned to a non-enemy proprietor, the law does not apply.

No. 18828/12. Aerostats; in aerostats, dirigibles, &c., in which the car is suspended from fabric appendages attached to the sides of the balloon and forming a keel, the keel appendage is made air-tight so as to be utilised as a ballonet. The space so formed may be filled with air by fans or by placing a non-return valve in the front of the chamber, so that air passes in owing to the motion of the balloon. Siemens Schuckertwerke, Berlin. Dated October 28th, 1911.

No. 12386/12. Air-ship shelters. The walls and roofs of a hangar for dirigible air-ships are made in halves carried by supports which are weighted at their lower ends and are pivoted at their centres of gravity. The airship is provided with pulleys around which pass anchor-ropes secured to the walls. In order to allow the ascent of the air-ship, the gable locks are pushed aside and the hangar is opened by rotating the halves about their pivots until the wall parts form an horizontal floor slightly above the ground level. Fischer, W., Germany. Dated May 27th, 1911.

No. 18829/12. Aerostats; in airships of the type in which the car is suspended by a keel-shaped fabric appendage, the balloon is given initially a larger section in the vicinity of the fabric suspension in order that a constriction may be avoided at this part when the load is applied. The section may be enlarged over the whole length of the appendage, or at two places only. Siemens Schuckertwerke, Berlin. Dated July 4th, 1912.



## Aeronautical Patents Published.

Applied for in 1914.

Published May 6th, 1915.

13,776. CAMBRIDGE SCIENTIFIC INSTRUMENT CO. AND H. DARWIN. Linear accelerometer for aircraft.  
17,990. H. D'O. BENINGFIELD. Aeroplanes.  
18,127. L. G. HAMMER. Appliances for carrying on oral communication between pilot and passenger.  
18,935. H. C. HERRY. Aerial machines.  
19,048. F. STRAVRUM. Aeroplanes.  
21,241. E. BLACK. Wind screens for aeroplanes, &c.

Applied for in 1915.

Published May 6th, 1915.

135. M. J. MUSTONEN. Flying machines.

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